

A taxonomic revision of the genus *Peperomia* Ruiz & Pav. (Piperaceae) in mainland Australia

Paul I. Forster

Summary

Forster, Paul I. (1993). A taxonomic revision of the genus *Peperomia* Ruiz & Pav. (Piperaceae) in mainland Australia. *Austrobaileya* 4(1): 93–104. The genus *Peperomia* Ruiz & Pav. (Peperomiaceae) is revised for mainland Australia. Five species are recognised, four are native, viz *Peperomia bellendenkerensis* Domin, *P. blanda* var. *floribunda* (Miq.) H. Huber, *P. tetraphylla* (G. Forst.) C. DC. and *P. enervis* C. DC. & F. Muell., and one is naturalised, viz *P. pellucida* (L.) Kunth. *Peperomia bellendenkerensis* and *P. enervis* are endemic. The names *Peperomia affinis* Domin, *P. bellendenkerensis* Domin and *P. enervis* C. DC. & F. Muell. are lectotypified. *P. affinis* is newly placed in the synonymy of *P. tetraphylla*.

Keywords: *Peperomia* – Australia; *Peperomia bellendenkerensis*; *Peperomia blanda* var. *floribunda*; *Peperomia tetraphylla*; *Peperomia enervis*; *Peperomia pellucida*.

Paul I. Forster, Queensland Herbarium, Meiers Road, Indooroopilly, Qld 4068, Australia

Introduction

The genus *Peperomia* Ruiz & Pav. is pantropical comprising over 1000 species mostly native to South America, with a few in Africa and Asia (Düll 1973). The genus is included in the Piperaceae (Cronquist 1981) or is often included in its own family Peperomiaceae. The flowers of *Peperomia* are greatly reduced and have no perianth. Each flower comprises two stamens, a single stigma and a fleshy floral bract that subtends the single ovary (Tucker 1980). These morphological features are thought to represent primitiveness and although members of the genus are usually considered di-cotyledons (e.g. Cronquist 1981), some authors consider them to be monocotyledons (Burger 1977).

Most species of *Peperomia* are herbaceous or succulent epiphytes, lithophytes or geophytes. Although the majority occur in moist rainforest communities, a number grow in drier communities in association with other types of succulents and possess anatomical features associated with avoiding water loss (Kaul 1977; Virzo de Santo *et al.* 1983; Holthe *et al.* 1992).

Bentham (1873) recognised two species from mainland Australia, viz *P. leptostachya* Hook. & Arn. and *P. reflexa* (L.f.) A. Dietr.

Bailey (1901) recognised three native species; those accepted by Bentham, plus *P. enervis* C. DC. & F. Muell. described in 1891. Domin (1928) subsequently described *P. bellendenkerensis*; however, there has been no modern account of the genus in Australia that takes into account all taxa and names.

All of the Australian species grow in closed forest communities; however, *P. blanda* var. *floribunda* is ± succulent and occurs widely in drier communities such as semi-evergreen vine thickets (Forster *et al.* 1991). Although many exotic rainforest species are cultivated, none of the Australian ones are to any extent (Forster 1986).

In this paper I review the systematics of the native and naturalised mainland Australian taxa of *Peperomia*, thus establishing synonymies and detailing distributions, prior to an abbreviated account in 'Flora of Australia'. A sixth species *P. urvilleana* A. Rich., is endemic to Lord Howe Island and will be dealt with by P.S. Green in 'Flora of Australia' Volume 50.

Materials and methods

Herbarium material at BO, BRI, CANB, CBG, DNA, JCT, MEL, NE, NSW and QRS was examined. Type material at BM, K and PR was obtained on loan to BRI or photographs of

specimens were examined. Field work was undertaken in Queensland and the Northern Territory from 1982 to 1992. All native taxa, excepting *P. bellendenkerensis*, were cultivated by the author under similar conditions in Brisbane.

The synonymies cover those names based on Australian material or that have been applied to plants in the region.

Descriptions were mainly prepared from fresh or spirit material. All trichomes are simple and uniseriate. Common abbreviations in the specimen citation are L.A. – Logging Area; N.P. – National Park, S.F. – State Forest; S.F.R. – State Forest Reserve. The ‘Wet Tropics’ is defined as that area of north-eastern Queensland that encompasses the ‘hot, humid vine forests’ from near Cooktown in the north to Paluma in the south (Webb & Tracey 1981; Barlow & Hyland 1988).

Taxonomy

Peperomia Ruiz & Pav., Prodr. 8 (1794). **Type:** *Peperomia secunda* Ruiz & Pav. (lecto: *fide* N.L. Britton, Fl. Bermuda 94 (1918)).

Hook.f., Fl. Tasman. xlvii (1859); C. DC., Prodr. 16(1): 448 (1869); Benth., Fl. Austral. 6: 205–206 (1873); F.M. Bailey, Queensl. Fl. 4: 1286 (1900); Domin, Biblioth. Bot. 89(4): 558–559 (1928);

Düll, Bot. Jahrb. Syst. 93: 56–129 (1973); S.C. Tucker, Amer. J. Bot. 67: 686–702 (1980); Stanley & E.M. Ross, Fl. S.E. Queensl. 1: 183 (1983); H. Huber, Rev. Handb. Fl. Ceylon 6: 273–300 (1987).

Derivation of name: from the Greek *peperi* (pepper) and *homoios* (alike) referring to the similarity of some species to certain *Piper* species.

Perennial herbs, terrestrial, epiphytic or lithophytic. Leaves alternate, opposite or whorled; exstipulate and petiolate; succulent to membranous. Spikes solitary, terminal, terminal and axillary, or leaf-opposed by overtopping, erect. Flowers hermaphrodite, sometimes partly embedded in spike axis, subtended by rounded to orbicular peltate bracts. Perianth absent. Stamens 2; filaments subulate, shorter or rarely longer than bracts; anthers bisporangiate, transverse-oblong or subglobose, two cells confluent at apex; pollen grains without an aperture. Ovaries distinct, sessile or contracted at base and substipitate; obtuse or rostrate at apex; with an entire capitate stigma. Fruits ovoid, obovoid or turbinate, exserted, not fleshy, often mucilaginous, sessile or shortly stipitate.

A genus of over 1000 species with its centre of distribution in Central and South America. Four native and 1 naturalised species in Australia.

Key to species of *Peperomia* in Australia

1. Leaves alternate 2
 Leaves opposite or whorled 3
2. Leaves 3-veined at base, foliage with scattered trichomes **1. P. bellendenkerensis**
 Leaves 5-veined at base, foliage glabrous **2. P. pellucida**
3. Leaves in whorls of 4 **3. P. tetraphylla**
 Leaves opposite or in a whorl of 3 4
4. Leaves opposite, ovate-elliptic to obovate, with dense trichomes and prominent secondary veins **P. blanda** var. **floribunda**
 Leaves usually 3 in a whorl, but occasionally opposite, cuneate-obovate, glabrous or with sparse trichomes and obscure secondary veins **5. P. enervis**

1. ***Peperomia bellendenkerensis*** Domin, *Biblioth. Bot.* 89(4): 559 (1928). **Type:** Queensland. COOK DISTRICT: in pluvii-lignosis mediae partis Bellenden-Ker, December 1909, K. Domin 2630 (lecto (here designated): PR525761!).

Succulent herb to 15 cm high. Stems erect, becoming decumbent, rooting at nodes, with scattered to sparse trichomes; internodes up to 20 mm long and 1.5 mm diameter. Leaves alternate, petiolate; lamina orbicular to elliptic-ovate, up to 16 mm long and 13 mm wide, membranous when dry, 3-veined from base with the 2 side veins somewhat indistinct; tip obtuse to rounded; base cuneate; petiole 0.8–1 mm long, 0.4–0.5 mm diameter, glabrous or with scattered trichomes. Spikes terminal, 20–40 mm long, solitary; peduncle 4–8 mm long, 0.5–0.8 mm diameter, glabrous; fertile axes 18–32 mm long, 0.8–1 mm diameter, glabrous. Flowers slightly sunken into axis, spaced 1–1.3 mm apart; floral bracts rounded, 0.4–0.5 mm long, 0.4–0.5 mm wide; anthers oblong, c. 0.2 mm long and 0.2 mm wide; ovary rounded, c. 0.4 mm long and 0.4 mm diameter. Drupes papillate, c. 0.6 mm long, 0.6 mm wide, 0.6–0.7 mm thick. **Fig. 1.**

Specimens examined: Queensland. COOK DISTRICT: Bellenden-Ker, Dec 1909, Domin 2631 (PR).

Distribution and habitat: Endemic to north-east Queensland. Known only from two collections by Domin from Bellenden Ker in the 'Wet Tropics'. Presumably these collections were made in rainforest.

Notes: The two Domin collections of *P. bellendenkerensis* represent a distinct species not conspecific with any of the other Australian species. Despite the lack of further collections from north Queensland, I feel that this species is a valid inclusion in the Australian flora. Small epiphytes in Australian rainforests are often poorly collected, and apart from those with horticultural potential (e.g. Orchidaceae), are poorly represented in herbaria such as BRI and QRS. A useful comparison may be found with one of the other Australian species of *Peperomia*, notably *P. tetraphylla*. There were no collections of *P. tetraphylla* from Cook botanical district in BRI or QRS prior to 1986, yet the

species is present, albeit infrequently, in easily accessible and well collected places such as S.F. 185 near Tinaroo Dam.

The Bellenden Ker massif is still unexplored in many places and it is likely that few recent collections have been made from the route taken by Domin (as described in Chapman (1986)), as most collectors have tended to ascend from the western side. Domin was based at Harvey's Creek for quite some time making various trips throughout the 'Wet Tropics' (Chapman 1990); however, it is not possible to deduce precisely where his collection of *P. bellendenkerensis* was made.

Domin (1928) did not specifically designate a type for his new name and of the two numbered collections of *P. bellendenkerensis* at PR, his number 2630 is fully fertile and the much better specimen, hence it is designated as lectotype for the name.

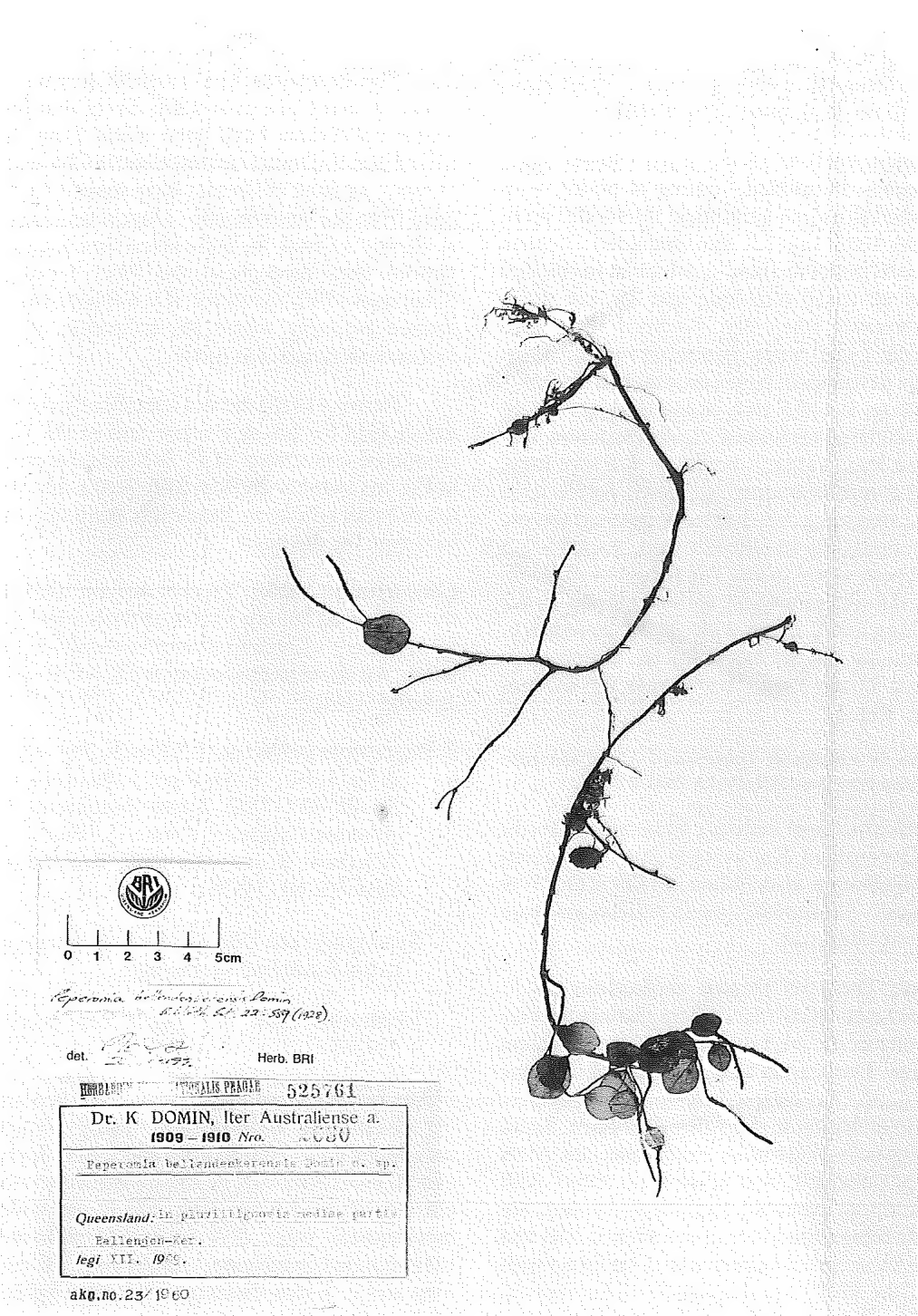
Conservation status: Further survey work is required along Domin's route up Bellenden Ker from Harvey's Creek to attempt to recollect this plant. An appropriate coding is 1K (cf. Briggs & Leigh 1988).

2. ***Peperomia pellucida*** (L.) Kunth, *Nov. Gen. & Sp.* 1: 64 (1815); *Piper pellucidum* L., *Sp. Pl.* 30 (1753). **Type:** Venezuela, 'In America Calidiore, Caracas', Humboldt 725 (neo: B, *n.v. fide* Düll, *Bot. Jahrb. Syst.* 93: 69 (1973)).

Synonymy: see Düll *l.c.* for full details of extra-Australian synonymy.

Illustration: Düll, *Bot. Jahrb. Syst.* 93: 73 (1973).

Fleshy herb to 30 cm high. Stems erect, becoming decumbent, rooting at nodes, glabrous; internodes up to 50 mm long and 2 mm diameter. Leaves alternate, petiolate; lamina ovate-elliptic, up to 3.5 cm long and 3 cm wide, membranous when dry, 5-nerved; tip acute; base rounded to cuneate; petiole up to 20 mm long and c. 1 mm diameter, glabrous. Spikes terminal or axillary in upper axils, solitary, up to 7 cm long; peduncle 5–13 mm long, c. 0.5 mm diameter, glabrous; fertile axes 20–50 mm long,



0 1 2 3 4 5cm

Peperomia bellendenkerensis Domin
Bot. Jahrb. 20: 27: 559 (1928)

det. *[Handwritten signature]* Herb. BRI

525761

Dr. K. DOMIN, Iter Australiense a.
1909 - 1910 No. 2080
Peperomia bellendenkerensis Domin n. sp.
Queensland: In puvilligasta medina partia
Bellendenker.
legit XII. 1908.

akg. no. 23/1960

Fig. 1. Type of *Peperomia bellendenkerensis*

c. 0.5 mm diameter, glabrous. Flowers not sunken into axis, spaced 0.4–1 mm apart; floral bracts rounded, 0.3–0.4 mm long, 0.2–0.3 mm wide; anthers oblong, c. 0.1 mm long and 0.1 mm wide; ovary rounded-oblong, c. 0.3 mm long and 0.3 mm wide. Drupes sticky, papillate 0.5–0.6 mm long, 0.2–0.3 mm long, 0.2–0.3 mm thick.

Selected specimens: India, Sikkim, south district: Ratey pani, Sep 1981, *Krishna* 1733 (BRI). Indonesia, Sumatera: east coast, *Yates* 1232 (BRI). Java: Buitenzorg, 1893–94, *Schiffner* 1853 (BRI). Papua New Guinea. BOUGAINVILLE PROVINCE: Vicinity of Barilo Village, c. 6 miles [10 km] N of Buin Station, Aug 1964, *Schodde* 3924 & *Craven* (BRI); Near Aku Village, c. 10 miles [16.7 km] W of Buin, Sep 1964, *Craven* 448 & *Schodde* (BRI); Vicinity of Kugugai Village, c. 10 miles [16.7 km] N of Buin Patrol Post, Jul 1964, *Schodde* 3650 & *Craven* (BRI). NEW BRITAIN PROVINCE: Malalia near Cape Hoskins, West Nakanai, Aug 1954, *Floyd* NGF6550 (BRI). MADANG PROVINCE: 4 km NW of Awar airfield, 4°06' S, 144°48' E, Jul 1992, *Forster* 10941 & *Liddle* (BRI, L, LAE, QRS). MOROBE PROVINCE: Botanical Gardens, 6°45' S, 147°00' E, May 1965, *Gillison* NGF22237 (BRI). CENTRAL PROVINCE: Maipa Village, Kairuka subdistrict, Sep 1962, *Darbyshire* 935 (BRI). Australia. Northern Territory: Darwin, *McKee* 8264 (DNA); Darwin, Lakes Cres., Northlakes, *Gallen* 111 (DNA). Queensland. DARLING DOWNS DISTRICT: Qld Agr. Coll. Nursery, Gatton, Jan 1981, *Swarbrick* WNA193 (BRI). Fiji. Lakosa, Nov 1922, *Greenwood* 562 (BRI); Rodwell Road, Suva, Oct 1960, *Pillay* [AQ077489] (BRI).

Distribution and habitat: Native to South America but naturalised widely in the Old World tropics including New Guinea and Australia. In Australia *P. pellucida* occurs as an occasional garden or nursery escape in Queensland and the Northern Territory, but is unlikely to become a serious weed.

Notes: The first mention of this species as naturalised in Australia appears to be by Cousins (1989) based on the McKee and Gallen collections. I saw little evidence of the plant around Darwin when I visited during 1989.

3. *Peperomia blanda* (Jacq.) Kunth., Nov. Gen. Sp. 1: 67 (1815). Type: Jacq., Ic. Pl. Rar. 2, t. 218 (1793).

P. blanda comprises two varieties, with only variety *floribunda* (Miq.) H. Huber present in Australia.

***Peperomia blanda* var. *floribunda* (Miq.) H. Huber, Rev. Handb. Fl. Ceylon 6: 294**

(1987); *P. arabica* var. *floribunda* Miq., Syst. Pip. 122 (1843). **Type:** Goudot in herb. Delessert (holo: G, n.v.).

***Peperomia leptostachya* Hook. & Arn., Bot. Beechey Voy. 70 (1832); *P. leptostachya* var. *leptostachya* Miq., De Peperaceis Novae Hollandiae 6 (1866); *P. blanda* var. *leptostachya* (Hook. & Arn.) Düll, Bot. Jahrb. Syst. 93: 110, abb. 16, 109–113 (1973); non *P. leptostachya* (Nutt.) Chapman (= *P. humilis* A. Dietr.), fide, Boufford, J. Arnold Arb. 63: 820 (1982) **Type:** Ins. Oahu, Hawaii, *Beechey* (iso: K (photo at BRI!)).**

***Peperomia dindygulensis* Miq., Syst. Pip. 122 (1843). Type:** Prov. Dindygul [Arabian Peninsula], *Wallich* 6663A (holo: K-W [fiche at BRI!]).

***Peperomia leptostachya* var. *laxiflora* Miq., De Peperaceis Novae Hollandiae 6 (1866). Type:** Queensland, MORETON DISTRICT: 'Pine-river', *F. Mueller* (n.v.).

***Peperomia baueriana* var. *brisbaniana* C. DC., Prodr. 16: 414 (1869). Type:** Queensland, MORETON DISTRICT: Brisbane River, 1855, *F. Mueller* (holo: G-DC [fiche BRI!]; iso: MEL!).

Illustrations: Düll, Bot. Jahrb. Syst. 93: 80, abb. 16 (1973); Williams, Native Pl. Queensl. 2: 217 (1984).

Succulent herb to 30 cm high. Stems erect, becoming decumbent, rooting at nodes, with sparse to dense short trichomes; internodes up to 22 mm long and 6 mm diameter. Leaves opposite, rarely whorled, petiolate; lamina ovate-elliptic to obovate, up to 3 cm long and 2.5 cm wide, membranous when dry, 5-nerved but with only the midrib and 2 major lateral nerves prominent; tip obtuse or acute, base cuneate to rounded; petiole up to 6 mm long and c. 1 mm diameter with sparse to dense trichomes. Spikes terminal in upper axils, up to 13 cm long; peduncle 5–15 mm long, 1.2–1.5 mm diameter, with sparse trichomes; fertile axes 30–115 mm long, 1.7–1.8 mm diameter, glabrous. Flowers not sunken into axis, spaced 1.4–2 mm apart; floral bracts rounded, 0.6–0.9 mm long, 0.7–0.8

mm wide; anthers oblong, c. 0.2 mm long and 0.3 mm wide; ovary rounded c. 0.4 mm long and 0.4 mm diameter. Drupes sticky, papillate, c. 0.8–0.9 mm long, 0.6–0.7 mm wide, 0.6–0.7 mm thick. **Figs 2C, 3.**

Selected specimens: Queensland. COOK DISTRICT: Ridge 1 km E of Kennedy Hill, 12°28'S, 143°16'E, Jun 1989, *Forster* 5421 (BRI); Garraway Creek rockpiles, 12°44'S, 143°11'E, Apr 1988, *Forster* 4225 & *Liddle* (BRI); T.R. 9

Lankelly Creek, 13°53'S, 143°14'E, Jun 1992, *Forster* 10328 *et al.* (BRI, QRS); Mt Windsor Tableland, May 1986, *Lockyer* s.n. (BRI, QRS); Slopes of Mt. Berni, *Brass* 2084 (BRI); Barron River Gorge, near Cairns, Jun 1935, *Blake* 9462 (BRI); Davies Creek, Lamb Range, Jun 1959, *Brass* 33554 (BRI, QRS). NORTH KENNEDY DISTRICT: Kinrara Crater, on 'Meadowbank' in McBride Plateau area, 18°20'S, 144°55'E, May 1970, *Webb & Tracey* 10257 (BRI). SOUTH KENNEDY DISTRICT: Carlisle Island, 20°47'S, 149°17'E, Sep 1986, *Sharpe* 4502 & *Batianoff* (BRI); Finch Hatton Gorge, Eungella Range, c. 30 miles [50 km] W of Mackay, May

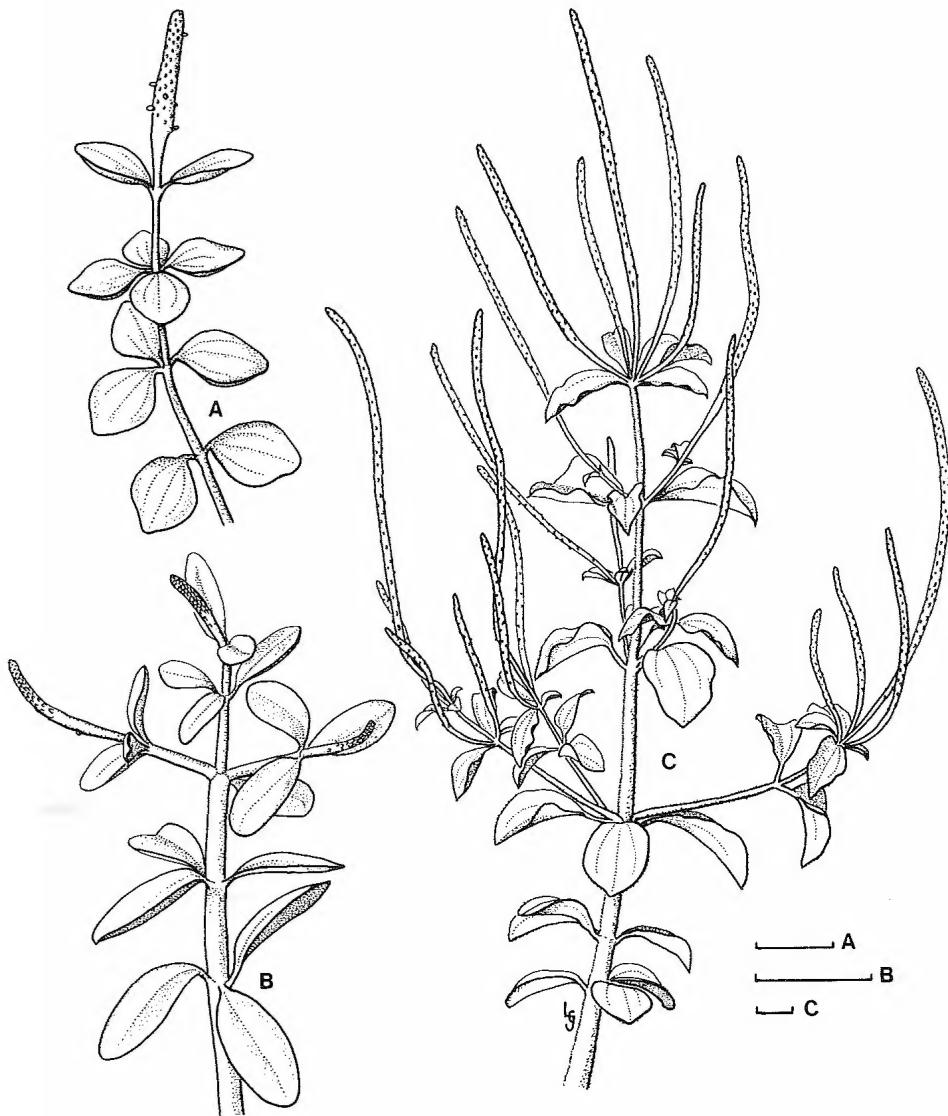


Fig. 2. A. *P. tetraphylla*, portion of stem of flowering plant. B. *P. enervis*, portion of stem of flowering plant. C. *Peperomia blanda* var. *floribunda*, portion of stem of flowering plant. A. *Forster* 3584 *et al.*; B. Tucker s.n. (Mt Haig area); C. *Forster* 2784. All at BRI. Scale bar = 10 mm. Del. L.G. Jessup.

1970, *Fagg* 665 (BRI, CBG). PORT CURTIS DISTRICT: Middle Percy Island, 87 miles SE of Mackay, May 1956, *Lazarides* 5674 (BRI, CANB); Crocodile Creek, Bouldercombe Gorge, 23°36'S, 150°28'E, Mar 1989, *Forster* 4991 (BRI). BURNETT DISTRICT: Castle Mt, c. 30 km N Monto, Nov 1976, *Stanley & Ross* s.n. (BRI); 7 km W of Windera, 26°03'S, 151°46'E, Feb 1986, *Forster* 2360 (BRI). WIDE BAY DISTRICT: Mt Bauple, Jun 1927, *White* 3534 (BRI). MORETON DISTRICT: Flinton Hill, Worlds End Pocket, 27°31'S, 152°45'E, Jul 1984, *Forster* 1544 (BRI); Burtons Gully, Egypt, 10 km WSW of Mt Whitestone, 27°43'S, 152°04'E, Oct 1985, *Forster* 2262 & *Bird* (BRI); Black Duck Creek Scrub, 27°50'S, 152°11'E, Jun 1987, *Forster* 2951 & *Bird* (BRI). New South Wales, Middle Arm Creek, 6 km WSW of Limpinwood, 28°20'S, 153°10'E, Aug 1986, *Forster* 2610 *et al.* (BRI); Iluka, c. 11 miles [17.7 km] NE of Maclean, Feb 1971, *O'Hara & Coveny* 3509 (BRI, NSW).

Distribution and habitat: Eastern Australia, from central New South Wales, more or less continuously up the east coast to Cape York Peninsula. Plants are a common component in vineforests and vinethickets where they occur terrestrially, lithophytically or rarely epiphytically.

P. blanda var. *floribunda* is widely distributed on the African continent (Düll 1973), Indian subcontinent (Huber 1987), Malesia and Melanesia. The seeds of *P. blanda* var. *floribunda* are noticeably sticky because of a mucilaginous substance around the papillate protuberances (Fig. 3). These morphological features may aid in dispersal of the species throughout its wide range. Plants are ± succulent and are able to withstand drier conditions than the other Australian species; however, the species is C₃ rather than CAM, in photosynthetic metabolism (Winter *et al.* 1983).

Notes: Type material of *P. leptostachya* var. *laxiflora* Miq. has not been located. It was not in MEL material loaned to BRI for study.

Conservation status: Common. Conserved in at least 22 conservation reserves in south-east Queensland (Forster *et al.* 1991).

4. *Peperomia tetraphylla* (G. Forst.) Hook. & Arn., Bot. Beechey Voy. 97 (1831); *Piper tetraphyllum* G. Forst., Fl. Ins. Austr. 5 (1786). **Type: Society Island, *Forster* (holo: BM, *fide* H. Huber, Rev. Handb. Fl. Ceylon 6: 292 (1987), but *n.v.* by author).**

Peperomia reflexa (L.f.) A. Dietr., Sp. Pl.

ed. 6, 1: 180 (1831); *Piper reflexa* L.f., Sp. Pl. Suppl. 91 (1781); non *Peperomia reflexa* Knuth (1815). **Type:** Cap. bonae spei., *Thunberg* (*n.v.*).

Peperomia affinis Domin in F.M. Bailey, Queensl. Agric. J. 24: 222 (1910). **Type:** Queensland, COOK DISTRICT: Atherton, J.F. Bailey (lecto (here designated): BRI!).

Illustration: Williams, Native Pl. Queensl. 2: 217 (1984).

Succulent herb to 10 cm high. Stems erect, becoming decumbent, rooting at nodes, glabrous or with scattered to sparse trichomes on upper nodes below apex; internodes up to 25 mm long and 1 mm diameter. Leaves in whorls of 4, petiolate; lamina ovate-rhomboidal to orbicular, up to 14 mm long and 9 mm wide, glabrous above, with sparse trichomes below when young, glabrous with age, coriaceous when dry, secondary veins obscure; tip obtuse, base cuneate to rounded; petiole up to 1 mm long and c. 1 mm diameter with sparse trichomes. Spikes terminal, up to 43 mm in length, solitary; peduncle 7–8 mm long, c. 1 mm diameter with sparse trichomes; fertile axes 10–35 mm long, 1.6–3 mm diameter, densely hispid. Flowers deeply sunken into axis, spaced 0.6–1 mm apart; floral bracts rounded, 0.3–0.5 mm long, 0.3–0.5 mm wide; anthers oblong, c. 0.4 mm long and 0.2 mm diameter; ovary rounded 0.4–0.6 mm long and 0.3–0.5 mm diameter. Drupes sticky, smooth, c. 1 mm long, 0.6 mm wide and 0.5–0.6 mm thick. **Figs 2A, 4.**

Selected specimens: Australia, Queensland. COOK DISTRICT: Hann's Tableland, 16°18'S, 145°15'E, Jul 1986, *Godwin* C3028 (BRI); Davies Creek L.A., 13.5 km past Davies Creek Falls, 17°04'S, 145°36'E, Mar 1988, *Forster* 3915 (BRI); S.F. 185 Danbulla, 17°06'S, 145°34'E, Jun 1992, *Forster* 10665 *et al.* (BRI, QRS). NORTH KENNEDY DISTRICT: c. 15 km N of Proserpine, Jul 1974, *Henderson* H2207 (BRI). SOUTH KENNEDY DISTRICT: Eungella Range, Oct 1922, *Francis* s.n. (BRI); Clarke Range, 1.5 km S of Mt William, Eungella N.P., 21°02'S, 148°36'E, Apr 1991, *Forster* 8063 (BRI). PORT CURTIS DISTRICT: Kroombit S.F. 316, Jun 1984, *Gibson* 642 (BRI); Dry Creek close to Forestry Camp, Kroombit Tops, 24°21'S, 150°58'E, Dec 1983, *Sharpe* 3488 (BRI). BURNETT DISTRICT: Bunya Mtns, Oct 1919, *White* s.n. (BRI). WIDE BAY DISTRICT: Guyra Mt, Mt Bauple N.P., 25°49'S, 152°35'E, Feb 1988, *Forster* 3543 *et al.* (BRI); Mt Cooroy, 26°26'S, 152°57'E, Nov 1988, *Forster* 4817 & *Bird* (BRI, CANB, K, MEL). DARLING DOWNS DISTRICT: Southern base of Spicers Peak, head

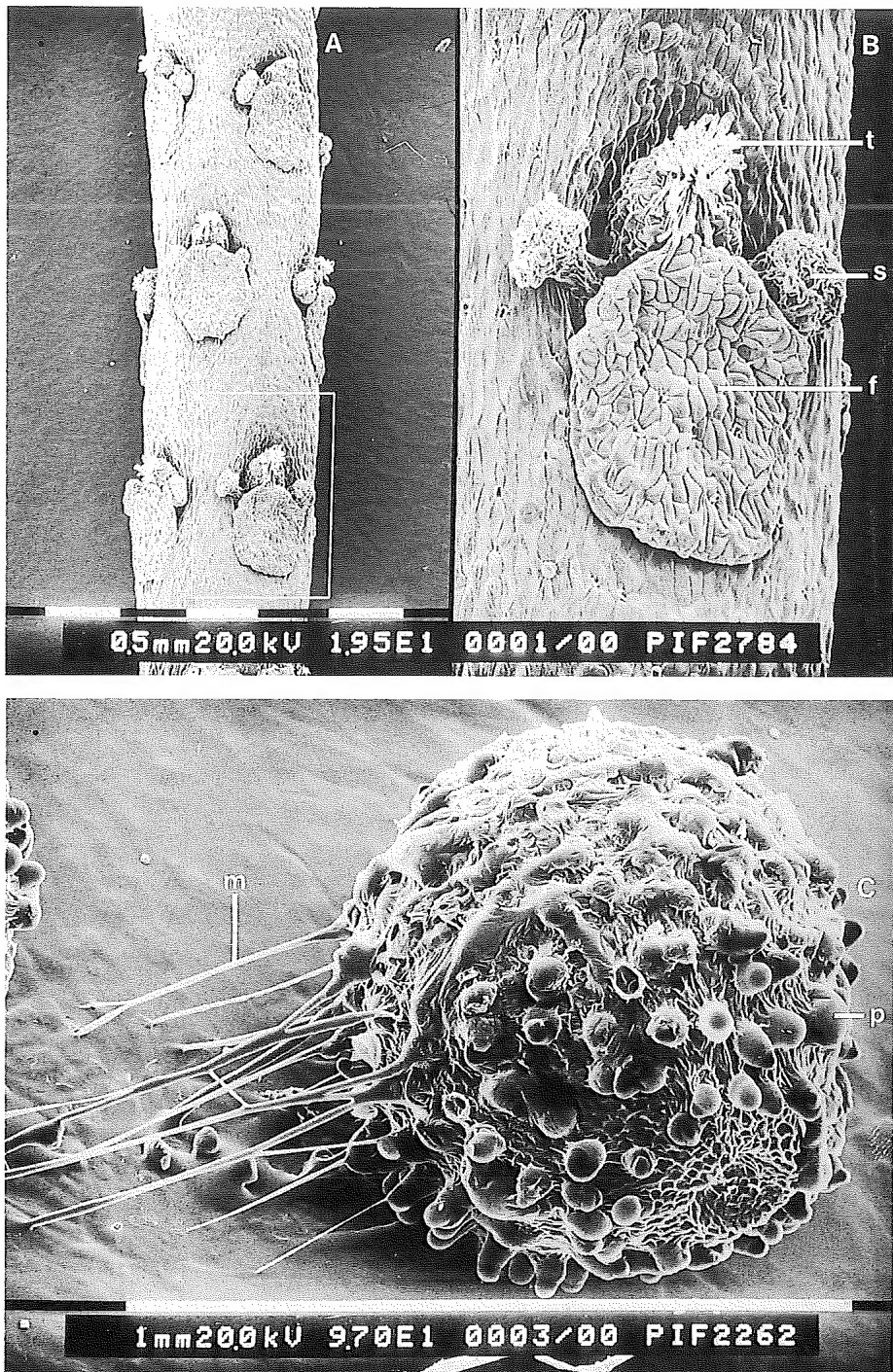


Fig. 3. *Peperomia blanda* var. *floribunda*. A. Scanning electron micrograph of part of inflorescence axis showing disposition of flowers, Scale bars = 0.5 mm. B. Close-up of individual flower. f = floral bract; s = stamen, t = stigma. C. View of seed from micropylar end showing the papillate protuberances (p) and the sticky mucilaginous substance (m). A, B from fresh material of Forster 2784 (BRI). C, from fresh material of Forster 2262 & Bird (BRI).

of Hell Hole Creek, 28°06'S, 152°24'E, Apr 1987, *Forster* 2902 (BRI). MORETON DISTRICT: head of London Creek, 26°48'S, 152°55'E, Nov 1986, *Forster* 2721 (BRI); Moonlight Crag, near O'Reillys Guest House, 28°14'S, 153°09'E, Nov 1988, *Forster* 4848 (BRI); Morans Falls, Lamington N.P., May 1937, *Blake* 13001 (BRI); Mt Ballow, Jul 1937, *Blake* 13086 (BRI). New South Wales. south slopes of Mt Lindesay on New South Wales - Queensland border, Oct 1969, *Schodde* 5610 (BRI, CANB); Middle Arm Creek, 6 km W Limpinwood, 28°19'S, 153°10'E, Aug 1986, *Forster* 2609 *et al.* (BRI); Gosford, Feb 1897, *Camfield* s.n. (BRI); Malara S.F., c. 20 miles [33.3 km] NW Tenterfield, May 1961, *Constable* s.n. (BRI).

Distribution and habitat: Widely distributed in Africa, Malasia, Melanesia and eastern Australia from southern New South Wales to the 'Wet Tropics' region of north-east Queensland. In eastern Australia, populations tend to be disjunct and restricted to the wetter rainforest communities such as mesophyll and notophyll vineforests. Plants usually grow epiphytically, but may be found occasionally as lithophytes. *P. tetraphylla* may grow in association with *P. enervis* in north-east Queensland.

Notes: With the exception of *P. affinis* Domin, synonymy for this species is taken from Düll (1973). Domin (1928) cited two syntypes for *P. affinis*. I have been able to locate only one of these, and this collection by J.F. Bailey is used to lectotypify the name.

Düll did not specifically state the location of the type of *Piper tetraphyllum* and although Huber (1987) gives it as being at BM, it was not located at that institution (T.D. Macfarlane, pers. comm. 1990).

Conservation status: Not threatened in Australia. It is considered as rare but well conserved in south-east Queensland with plants recorded in at least 9 conservation reserves (Forster *et al.* 1991).

5. *Peperomia enervis* C. DC. & F. Muell., Vict. Nat. 8: 109 (1891). Type: Queensland. COOK DISTRICT: Mt Bartle Frere, 1890, S. Johnson (lecto (here designated): MEL!; isolecto: BRI!).

Peperomia johnsonii C. DC., Ann. Conserv. Jard. Bot. Geneve 1898: 286 (1898). **Type:** 'In Australiae boreali-orientalis monte

Bartle Frere, altitud. 5000 ped. (Stephen Johnson in h. Cand.)' (holo: G-DC, *n.v.*).

Illustration: Williams, Native Pl. Queensl. 3: 243 (1988).

Succulent herb to 30 cm high. Stems erect, becoming decumbent, rooting at nodes, glabrous; internodes up to 3 cm long and 1 mm diameter. Leaves opposite, or in whorls of 3, petiolate; lamina cuneate or obovate, up to 15 mm long and 7 mm wide, membranous when dry, secondary venation obscure; tip obtuse, base cuneate; petiole up to 2 mm long and 0.5–0.6 mm diameter, glabrous. Spikes terminal, up to 6 cm in length, solitary or very rarely paired; peduncle 5–8 mm long, c. 1 mm diameter, glabrous; fertile axes 21–50 mm long, 0.8–1.8 mm diameter, glabrous. Flowers slightly sunken into axis, spaced 0.9–1.3 mm apart; floral bracts rounded, 0.4–0.5 mm long, 0.4–0.5 mm wide; anthers oblong, c. 0.2 mm long and 0.2 mm long; ovary rounded 0.3–0.4 mm long and 0.2–0.3 mm diameter. Drupes sticky, papillate, c. 1 mm long, 0.7 mm wide and 0.6–0.7 mm thick. **Figs 2B, 4.**

Selected specimens: Queensland. COOK DISTRICT: Intake, Mossman Gorge, Jun 1937, *Flecker* (QRS); Mossman River Gorge, Feb 1932, *Brass* 2071 (BRI); Mossman, Dec 1954, *Blake* 19759 (BRI); 32.8 km past Julatten on Mt. Lewis road, 16°30'S, 145°16'E, Jun 1988, *Forster* 4328 & *Liddle* (BRI); 19.1 km past Julatten on Mt. Lewis road, 16°34'S, 145°17'E, Apr 1988, *Forster* 3981 & *Liddle* (BRI); Davies Creek L.A., 13.5 km past Davies Creek Falls, 17°04'S, 145°36'E, Mar 1988, *Forster* 3914 (BRI); Adeline Creek, Mt. Windsor Tableland, May 1986, *Lockyer* s.n. (BRI); Mt. Haig area, Oct 1986, *Tuckers* s.n. (BRI); Tinaroo Range, road from Downfall Creek, Feb 1962, *Webb & Tracey* 5767 (BRI); S.F.R. 607, Emerald L.A., 17°05'S, 145°35'E, Jun 1979, *Stocker* 1735 (QRS); Kauri Creek road, 4 km from Tinaroo Dam end, S.F. 185 Danbulla, 17°06'S, 145°35'E, Jan 1992, *Forster* 9547 (BRI, K, L, MEL, QRS); Zillie Falls, Theresa Creek road, Millaa Millaa area, Jul 1980, *Williams* 80116 (BRI); Mt Bartle Frere, 1889, *Bailey* (BRI); ditto, Oct 1935, *Blake* 9815 (BRI); Johnson Place, Boonjie on Gurkha Pocket road, W Slope Bartle-Frere Mountain, Apr 1959, *Thorne & Jones* 20926 (BRI); Forest Reserve 756, Carter L.A., 17°40'S, 145°55'E, Jun 1966, *Hyland* 4116 (BRI). SOUTH KENNEDY DISTRICT: Dalrymple Heights & vicinity, Bee Creek, Jul-Nov 1947, *Clemens* (BRI); Finch Hatton Gorge, above Dooloomai Falls, Eungella N.P., 21°03'S, 148°38'E, Apr 1991, *Forster* 8103 (BRI); Broken River walking track, Eungella N.P., 21°10'S, 148°30'E, Apr 1991, *Forster* 8071 (BRI); 4 km past Cockies Creek crossing, Crediton S.F. 679, 21°16'S, 148°33'E, Aug 1990, *Forster* 7336 (BRI).

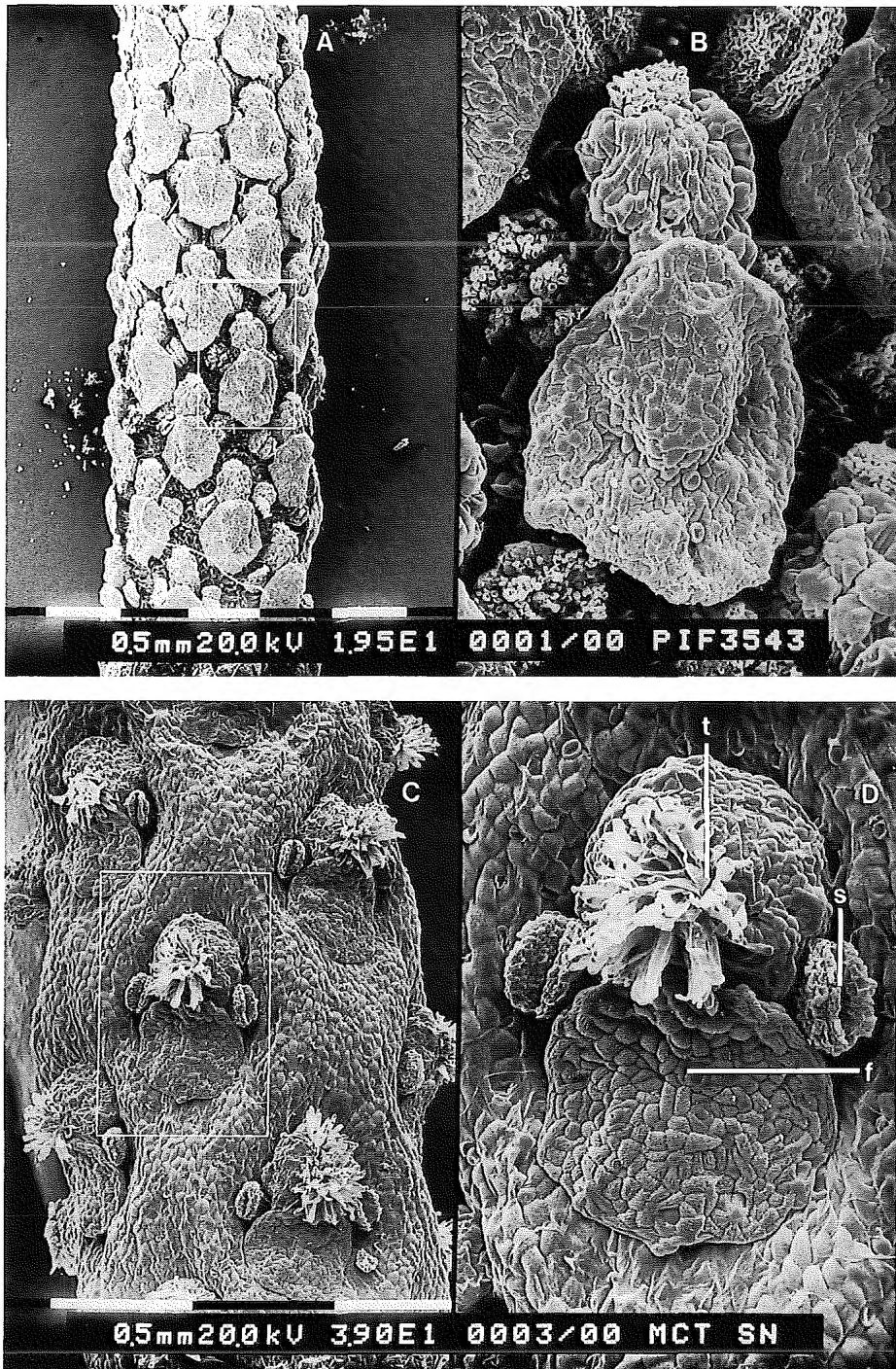


Fig. 4. *Peperomia tetraphylla*. A. Scanning electron micrograph of part of inflorescence axis showing disposition of flowers, Scale bar = 0.5 mm. B. Close-up of individual flower. *Peperomia enervis*. C. Scanning electron micrograph of part of inflorescence axis showing disposition of flowers, Scale bar = 0.5 mm. D. Close-up of individual flower. f = floral bract, s = stamen, t = stigma. A, B, from fresh material of Forster 3543 *et al.* (BRI). C, D, from fresh material of Tucker s.n. (Mt Haig area) (BRI).

Distribution and habitat: Endemic to Australia in the 'Wet Tropics' of north Queensland, with several disjunct records from the Eungella area. Plants of *P. enervis* are nearly always epiphytic or lithophytic in wet rainforest communities. This species may grow in association with *P. tetraphylla* in the 'Wet Tropics'; however, *P. enervis* is by far the commoner plant of the two in this region.

Notes: The holdings of this species at the Queensland Herbarium (BRI) have in the past been labelled as *P. johnsonii* C. DC. since R. Düll annotated a number of specimens with this name in 1966. Although Mueller (1891) thanks C. De Candolle for his assistance in the description of *P. enervis* and allocates him co-authorship, De Candolle (1898) made no mention of the species in his description of *P. johnsonii* (as *P. johsonii*, but evidently a typographical error as the collector is listed as Stephen Johnson in the protologue). Despite the somewhat different type citation, it is probable that the type specimens of both *P. enervis* and *P. johnsonii* are from the same collection by Stephen Johnson, with the type of the latter having been sent to De Candolle by Mueller.

Mueller (1891) did not specify a herbarium of deposition for the type of his name, hence this name is lectotypified with the MEL sheet, with an isolectotype at BRI.

As with all species of *Peperomia*, *P. enervis* varies under different growing conditions. Plants from the vicinity of Bellenden Ker may be quite variable; however, this variation appears largely phenotypic as the differences disappear after cultivation of different clones under similar conditions.

Peperomia enervis is closely allied to *P. tenuipila* C. DC. from New Guinea, which from examination of dried material only, differs from the Australian plant mainly in the densely hirsute stems and young leaves.

Conservation status: Common throughout its range.

Acknowledgments

L.G. Jessup prepared Figure 2. Special collections of plants were made by D.M. Cumming in

Africa and the Philippines, and R. Lockyer and M.C. Tucker in Queensland. Assistance with field work over the years was given by L.H. Bird, P.D. Bostock, G. Kenning, D. & I. Liddle, R. Harvey, W.J. McDonald, D. Orford, M.C. Tucker and P.R. Sharpe. Translation of parts of the Düll text was undertaken by P.R. Sharpe. The Directors/Curators of the herbaria cited allowed access to collections at their institutions. T.D. Macfarlane (PERTH) while Australian Botanical Liaison Officer at Kew, United Kingdom, located and photographed several types.

References

- BAILEY, F.M. (1901). *Peperomia*. In *Queensland Flora* 4: 1286. Brisbane: Government Printer.
- BARLOW, B.A. & HYLAND, B.P.M. (1988). The origins of the flora of Australia's wet tropics. *Proceedings of the Ecological Society of Australia* 15: 1–17.
- BENTHAM, G. (1873). Piperaceae. In *Flora Australiensis* 6: 203–207. London: L. Reeve & Co.
- BRIGGS, J.D. & LEIGH, J.H. (1988). *Rare or Threatened Australian Plants*. 1988 Revised Edition. Australian National Parks and Wildlife Service Special Publication No. 14. Canberra: Australian National Parks and Wildlife Service.
- BURGER, W.C. (1977). The Piperales and the monocots – alternate hypothesis for the origin of monocotyledonous flowers. *Botanical Review* 43: 345–393.
- CHAPMAN, A.D. (1986). Karl Domin's visit to Mt. Bellenden Ker (1909–1910). *Australian Systematic Botany Society Newsletter* 48: 1–8.
- (1990). Domin and Danes in Java and Australia 1909–1910. In P.S. Short (ed.), *History of Systematic Botany in Australasia* pp. 159–163. Melbourne: Australian Systematic Botany Society.
- COUSINS, S.N. (1989). *Checklist of Vascular Plants of the Darwin Region, Northern Territory Australia*. Northern Territory Botanical Bulletin No. 8. Darwin: Conservation Commission of the Northern Territory.
- CRONQUIST, A.J. (1981). *An Integrated System of Classification of Flowering Plants*. New York: Columbia University Press.
- DE CANDOLLE, C. (1898). Piperaceae Novae. *Annuaire du Conservatoire et du Jardin Botanique de Genève* 2: 252–291.

- DOMIN, K. (1928). *Peperomia*. In Beiträge zur Flora und Pflanzengeographie Australiens. *Bibliotheca Botanica* 89: 558–559.
- DÜLL, R. (1973). Die *Peperomia*-arten Afrikas. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 93: 56–129.
- FORSTER, P.I. (1986). Notes on *Peperomia* Ruiz & Pavon (Peperomiaceae), occasional epiphytes from Australia. *Epiphytes* 10: 84–88.
- FORSTER, P.I., BOSTOCK, P.D., BIRD, L.H. & BEAN, A.R. (1991). *Vineforest Plant Atlas for South-East Queensland*. Brisbane: Queensland Herbarium.
- HOLTHE, P.A., PATEL, A. & TING, I.P. (1992). The occurrence of CAM in *Peperomia*. *Selbyana* 13: 77–87.
- HUBER, H. (1987). Piperaceae. In M.D. Dassanayake (ed.) *A Revised Handbook to the Flora of Ceylon* 6: 272–300. New Delhi: Amerind Publishing Co. Pty Ltd.
- KAUL, R.B. (1977). The role of the multiple epidermis in foliar succulence of *Peperomia* (Piperaceae). *Botanical Gazette* 138: 213–218.
- Austrobaileya 4(1): 93–104 (1993)
- MUELLER, F. (1891). Descriptions of new Australian plants, with occasional other annotations. *Victorian Naturalist* 8: 109–111.
- TUCKER, S.C. (1980). Inflorescence and flower development in the Piperaceae. I. *Peperomia*. *American Journal of Botany* 67: 686–702.
- VIRZO DE SANTO, A., ALFANI, A., RUSSO, G. & FIORETTO, A. (1983). Relationship between CAM and succulence in some species of Vitaceae and Piperaceae. *Botanical Gazette* 144: 342–346.
- WEBB, L.J. & TRACEY, J.G. (1981). Australian rainforests: pattern and change. In A. Keast (ed.), *Ecological Biogeography of Australia*. pp. 605–694. The Hague: W. Junk.
- WINTER, K., WALLACE, B.J., STOCKER, G.C. & ROKSANDIC, Z. (1983). Crassulacean acid metabolism in Australian vascular epiphytes and some related species. *Oecologia* 57: 129–141.